✓ C. IN THE DRAWINGS:

Please accept the proposed drawing corrections shown in red for Figures 9A-K enclosed herein. Please also accept the substitute Figures 1-26 on 54 drawing sheets enclosed herein, wherein the corrections of Figures 9A-K are submitted in clean form.

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II. IN RESPONSE TO THE OFFICE ACTION:

Claims 1-19 are pending in the application. Claim 1 has been amended to correct a typographical error by reversing the order of the words "pole" and "stationary" in line 14 of the claim. A marked-up version of claim 1 as amended by this response is attached in Appendix A. If for any reason there is a discrepancy between the amendments contained in this paper and the attached marked-up version of the claims, Applicant requests that the amendments of this paper be considered controlling.

The specification has been amended to correct minor typographical errors or matters of form only. No new matter has been added by these amendments. Marked-up versions of the amended paragraphs are attached in Appendix B.

Proposed changes to the drawings of Figures 9A-K are enclosed herewith in Appendix C. No new matter has been added by these proposed corrections. Applicant has also submitted substitute Figures 1-26 on 54 drawing sheets attached in Appendix D. The substitute Figures 1-26 are fully supported by the originally filed drawings and incorporate the proposed corrections of Figures 9A-K in clean form.

A. OBJECTIONS:

1. The Information Disclosure Statement filed January 29, 2001 was objected to as failing to comply with 37 C.F.R. 1.98(a)(2), which requires a legible copy of each reference. It is Applicant's understanding that the Information Disclosure Statement filed January 29, 2001 included legible copies of the references cited. A copy of the returned Postcard is attached hereto

in Appendix E, whereon the Office of Initial Patent Examination evidences receipt of the references. A Supplemental Information Disclosure Statement with references is submitted under separate cover.

2. The Information Disclosure Statement filed January 29, 2001 was objected to as failing to comply with 37 C.F.R. 1.98(a)(3) because it does not contain a concise explanation of the relevance of each patent that is not in the English Language. The Supplemental Information Disclosure Statement submitted under separate cover includes these explanations.

B. REJECTION UNDER 35 U.S.C. § 102(E), OR IN THE ALTERNATIVE UNDER 35 U.S.C. § 103(A):

1. In paragraph 1 of the Office Action, claims 1-3 stand rejected under 35 U.S.C. §102(e) as being anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over Kamata (U.S. Patent No. 6,025,658).

Kamata discloses a linear motor having an arrangement of permanent magnets (1a-f and 2a-f). The permanent magnets (1a-f, 2a-f) are arranged to generate a sine magnetic field (col. 3, lines 16-21). A plurality of coils (5) is energized with sine currents defined by their corresponding position (x) in this sine magnetic field (col. 3, line 42 to col. 4, line 59). By supplying sine currents "to polyphase coils in a sine magnetic field or approximately sine magnetic field, the thrust becomes constant or nearly constant, and a good linear motor with small thrust ripples can be realized" (col. 4, lines 35-39).

Applicant's independent claim 1, as originally filed, contains limitations not disclosed or suggested in McKee.

- Claim 1 requires "a circuit for energizing the phase winding over a plurality of energization cycles to produce a given force tending to cause linear movement of the movable member with respect to the stationary member, the energizing of the phase winding also producing a normal force tending to cause movement of the movable and stationary members in a direction normal to the desired linear movement; wherein the normal force profile experienced by the at least one stationary pole over a first

energization cycle is different from the normal force profile experienced by the at least one stationary pole over a subsequent energization cycle."

Kamata does not disclose or suggest the limitations of the circuit, energization cycles, and normal force profiles, as required by claim 1. In the claimed invention, the circuit energizes the phase winding over a plurality of energization cycles. In fact, contrary to claim 1, Kamata specifically discloses and suggests supplying a sinusoidal energization to the coils (5). Thus, the machine disclosed and suggested in Kamata lacks the discrete, first and subsequent energization cycles of the phase winding provided by the circuit of claim 1.

Furthermore, claim 1 requires that "the normal force profile experienced by the at least one stationary pole over a first energization cycle is different from the normal force profile experienced by the at least one coil over a subsequent energization cycle." Because the sinusoidal energization of the coil (5) is determined by its location (x) in the sine magnetic field, the normal forces in Kamata are substantially constant on the energized coil (5) as it moves along the moving direction (x) in the sine magnetic field. Thus, the machine of Kamata is not capable of providing the different normal force profiles on the energized pole required by claim 1.

Accordingly, limitations in claim 1 are not suggested or disclosed in Kamata. Moreover, without the suggestion of these limitations, it would not have been obvious at the time of the invention was made for the linear motor of Kamata to function in the way being claimed in claim 1.

Furthermore, no combination of the references cited in the Office Action could produce the claimed invention, because none of the other cited references discloses or suggests the claim limitations missing from Kamata. For example, in contrast to the present invention, U.S. Patent No. 3,919,607 to Habbock et al. discloses a pole piece (7) for a magnetic-suspension vehicle employing an excitation winding (4) and traveling field windings (5) and (6). "The pole piece 7 along with the magnetic-suspension vehicle *is maintained in a state of suspension by electromagnetic-suspension means not shown*" emphasis added (col. 4, lines 24-"29). Habbock et al. is only directed to controlling oscillations in forward propulsion motion and is silent as to any normal component between the pole piece (7) and reaction rail (8). In fact, the normal

component between the pole piece (7) and reaction rail (8) is only described as being maintained by electromagnetic-suspension means not shown. Thus, Habbock et al. doe not suggest or disclose the limitations missing from Kamata.

For at least the reasons presented above, Applicant respectfully requests that the above rejection of independent claim 1 under 35 U.S.C. §102(e), or in the alternative under 35 U.S.C. §103(a) be reconsidered and withdrawn and that the Examiner indicate the allowance of the claim in the next paper from the Office. The claims depending from claim 1 are believed to be allowable for at least the same reasons discussed above.

2. In paragraph 6 of the Office Action, claims 14-15 stand rejected under 35 U.S.C. §102(e) as being anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over Nitta (U.S. Patent No. 6,181,047).

Nitta discloses a motor having rotor magnets (23) and a stator having first and second teeth (15) and (16). The rotor magnets (23) are distributed uniformly about the rotor. The first heads (15a) of the first teeth (15) define an air gap (G1) with the rotor magnets (23) that is circumferentially uniform. The second heads (16a) of the second teeth (16) define a different are gap (G2) with the rotor magnets (23) (see col. 3, line 35 to col. 4, line 15).

Applicant's independent claim 14, as originally filed, contains limitations not disclosed or suggested in Nitta.

- Claim 14 requires "a circuit for energizing the at least one current carrying member over a given interval so as to simultaneously energize the first and second sets of opposing stator poles; the energizing of the current carrying member also producing normal forces tending to cause movement of the energized stator poles towards the rotor; wherein the normal force profile experienced by the first pair of opposing stator poles over the given interval is substantially different from the normal force profile experienced by the second pair of opposing stator poles over the given interval."

The claimed invention addresses the normal forces between energized stator poles with rotor poles. The energization of the current carrying member is discrete, involving simultaneous

energization of distinct stator poles about the stator. Therefore, the normal forces arising from the simultaneous energization over a given interval also simultaneously occurs at distinct locations around the stator. In the claimed invention, the normal force profile experienced by one pair of opposing stator poles when energized over the given interval is substantially different from the normal force profile experienced by another pair of opposing stator poles when simultaneously energized over the same, given interval.

In contrast to the claimed invention, the motor disclosed in Nitta addresses reducing noise by canceling the net cogging torque. Cogging torque is produced in a permanent magnet machine by the magnetic attraction between the rotor-mounted permanent magnets and the stator. The cogging torque addressed by Nitta is due to magnet excitation phenomenon between the rotor magnets with stator poles, regardless of whether the stator poles are energized or not. Cogging torque has a positive peak when the rotor poles pass from an unstable detent position to a stable detent position and has a negative peak when the rotor poles pass from the stable detent position to an unstable detent position. Thus, the peak of the cogging torque occurs cyclically at a plurality of openings between the stator teeth as the rotor rotates, regardless of which stator teeth are energized.

To reduce the net cogging torque, Nitta discloses providing graded air gaps on the second heads (16a) of the second teeth (16). The second heads (16a) define larger air gaps (G2) at their leading and trailing edges, which produces a gentler ramp of the cogging torque to peak value. However, different air gaps, such as those described in Figure 8 of Nitta, can cause a difference in magnetic resistance from each tooth. "Consequently, the differences in magnetic resistance vary an electromagnetic force when the armature windings are energized so that the rotor is rotated. This results as vibration and noise in the motor" (col. 1, lines 64-67). As a result, Nitta also discloses a technique to minimize the magnetic resistance from each stator teeth (15) and (16) so that the electromagnetic force will not vary when the armature windings are energized. To achieve this, Nitta discloses that the second teeth (16), in addition the graded air gap (G2), also include circumferentially central portions defining the same air gap (G1) as the first teeth (15). Thus, Nitta teaches away from the claimed invention and specifically discloses and

suggests reducing the variance between the electromagnetic forces of the stator poles when the armature windings are energized. In contrast, the claimed invention requires that "that normal force profile experienced by the first pair of opposing stator poles over the given interval is substantially different from the normal force profile experienced by the second pair of opposing stator poles over the given interval."

In further contrast to the claimed invention, Nitta employs a driving mechanism using overlapping, sinusoidal energizations of the stator poles. This driving mechanism is disclosed in U.S. Patent No. 5,778,703 (Imai et al) at col. 10, line 60 to col. 11, line 24 and Figures 12A-E and is incorporated by reference in Nitta at col. 6, line 67 to col. 7, line 4. The claimed invention requires "a circuit for energizing the at least one current carrying member over a given interval so as to simultaneously energize the first and second sets of opposing stator poles."

Accordingly, Nitta does not suggest or disclose the limitation of "a circuit for energizing the at least one current carrying member over a given interval so as to simultaneously energize the first and second sets of opposing stator poles; the energizing of the current carrying member also producing normal forces tending to cause movement of the energized stator poles towards the rotor; wherein the normal force profile experienced by the first pair of opposing stator poles over the given interval is substantially different from the normal force profile experienced by the second pair of opposing stator poles over the given interval." Moreover, it would not have been obvious at the time of the invention was made for the stator of Nitta to have normal forces acting with the rotor as claimed in claim 14, because Nitta does not suggest or disclose these limitations.

For at least the reasons presented above, Applicant respectfully requests that the above rejection of independent claim 14 under 35 U.S.C. §102(e), or in the alternative under 35 U.S.C. §103(a) be reconsidered and withdrawn and that the Examiner indicate the allowance of the claims in the next paper from the Office. The claims depending from claim 14 are believed to be allowable for at least the same reasons discussed above.

3. No combination of the other references cited in the Office Action with Nitta provide the limitations of claim 14 missing from Nitta. In paragraphs 7-9 of the Office Action, claims 16-17, 18, and 19, which depend from independent claim 14, stand rejected under 35 U.S.C. 103(a) as being unpatentable over Nitta in view of U.S. Patent No. 5,670,836 to Horst, in view of U.S. Patent No. 5.396.137 to Shinto et al., and in view of U.S. Patent No. 4,132,932 to Wanlass, respectively.

Horst '836 is directed to aligning a rotor with a stator in a parked position for providing more starting torque. Horst '836 discloses using homopolar stator poles with indentations (36) to align in a stable detent position with homopolar rotor poles when the machine is stopped, *i.e.,* when the stator poles are not energized (see col. 4, lines 8-32). Because aligning of the rotor with the stator is performed when the stator poles are not energized, Horst '836 is silent as to the stator windings, energizations, normal forces, and circuit for energizing the windings. Therefore, Horst '836 does not provide the limitations required by claim 14 that are missing from Nitta.

Shinto et al. is directed to reducing the cogging torque of a brushless, permanent magnet motor by altering slot-pitch. Shinto et al. discloses a motor having a stator (11) and a rotor (15). The stator (11) has a core (12) with a plurality of slots (18) "arranged with a uniform angular interval." The rotor (15) consists of a permanent magnet (16) and a rotor core (17). The permanent magnet (16) is disclosed as being a multiple magnet having four or six poles. In each of the embodiments disclosed in FIGS 2-7, the poles of the rotor have differing angular widths. For example, in FIGS. 1-2, the four poles "have respective occupation angles θ11 of 97.5°, θ12 of 97.5°, θ13 of 82.5°, and θ14 of 82.5° in the rotating direction of the rotor 15" (col. 3, line 54 to col. 4, line 3). Because cogging torque is due to magnet excitation phenomenon and not energization of the stator poles, Shinto et al. is silent as to the stator windings, energizations, normal forces, and circuit for energizing the windings. Therefore, Shinto et al. does not provide the limitations required by claim 14 that are missing from Nitta.

In contrast to Shinto et al., claim 14 also requires that "the angular widths of each of the rotor poles are substantially the same." Therefore, combining the stator of Shinto et al. with the rotor of Nitta as applied to dependent claim 18 and proposed in paragraph 8 of the Office Action

would merely produce a conventional permanent magnet machine still lacking the limitations required by claim 14.

Wanlass is directed to maintaining the flux density in a stator. Wanlass discloses a single-phase AC induction motor of the squirrel cage type having a main stator winding (24) and an auxiliary stator winding (30) connected in parallel. The auxiliary winding (30) has a split phase arrangement with respect to the main winding (24). The main winding (24) is connected in series with a capacitor to maintain the flux density at a maximum level. Wanlass discloses using constrictions on the teeth between the back iron and the main windings (24). The constrictions are used to limit the magnetic flux density generated in these windings (24) as compared to the other windings (30) and to enable the motor to operate as a balanced split phase motor (see col. 5, lines 44-68).

"Since the energy transferred by each winding is determined by the well known equation $F=BlI$, and since l and I are the same for both windings, keeping the flux densities relatively equal and constant means that the energy transferred to the rotor by each of the windings is relatively equal and balanced operation is obtained over a wide range of operating conditions" (col. 6, lines 1-8). Consequently, the normal component of this energy transferred to the rotor by each of the windings is also relatively equal. Therefore, Wanlass does not provide the limitations required by claim 14 that are missing from Nitta.

For at least the reasons presented above, Applicant believes that no combination of these other references cited in the Office Action with Nitta provide the limitations of claim 14 missing from Nitta.

C. REJECTION UNDER 35 U.S.C. § 102(B) , OR IN THE ALTERNATIVE UNDER 35 U.S.C. § 103(A):

In paragraph 3 of the Office Action, claims 6-8 and 11-13 stand rejected under 35 U.S.C. §102(b) as being anticipated by, or in the alternative under 35 U.S.C. §103(a) as obvious over Horst (U.S. Patent No. 5,844,343).

Horst discloses reluctance motors (10) having homopolar rotors (22) with like poles symmetrically arranged on the rotor. The poles provide a more uniform flux level and position

the rotor (22) in a stable deposition to facilitate starting of the motor. In contrast to the present invention, Horst is directed to controlling auxiliary windings (28) on the stator that are energized when the machine is off to position the rotor in a preferred aligned position before starting.

Applicant's independent claim 6, as originally filed, contains limitations not disclosed or suggested in Horst.

- Claim 6 requires that "the normal force profile experienced by the at least two stator poles over a first energization cycle is different from the normal force profile experienced by the at least two stator poles over a subsequent energization cycle."

Horst merely discloses and suggests that the run windings are used during normal operation and that the auxiliary windings are energized when the machine is off to move the rotor to a preferred aligned position for starting the motor. Horst does not suggest or disclose that the stator poles (18a, 18c) having the run windings 20,21 experience a normal force profile over one energization that is different than a normal force profile over a subsequent energization. Accordingly, limitations in claim 6 are not suggested or disclosed in Horst. Without even the suggestion or teaching of the limitations required by claim 6, it would not have been obvious at the time of the invention was made for the motor of Horst to function in the way being claimed. Furthermore, no combination of the references cited in the Office Action could produce the claimed invention, because none of the other cited references discloses or suggests the claim limitations missing from Horst.

For at least the reasons presented above, Applicant respectfully requests that the above rejection of independent claim 6 under 35 U.S.C. §102(b), or in the alternative under 35 U.S.C. §103(a) be reconsidered and withdrawn and that the Examiner indicate the allowance of the claims in the next paper from the Office. The claims depending from claim 6 are believed to be allowable for at least the same reasons discussed above.

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In order to facilitate the resolution of any issues or questions presented by this paper, Applicant respectfully requests that the Examiner directly contact the undersigned by phone to further the discussion, reconsideration, and allowance of the claims.

Respectfully submitted,

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